Chapter 6 Curriculum and Assessment: Strategies and Resources to Activate Learning

Chapter Introduction by Cristián Rizzi

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"As teachers change the way they teach, technology is providing powerful new ways to assess student progress, both to improve outcomes by providing immediate and highly targeted feedback, and to increase accountability."

In the hands of capable, well-supported teachers, digital content and resources can help students develop the skills and attitudes they need for the 21st century. These include cultural understanding, creativity, teamwork, critical thinking, digital citizenship, and others. Teachers can also use technology to help develop students' attitudes and ability to consider others' opinions and ideas, as well as a sense of fraternity and altruism. These skills and attributes are necessary for graduates whether their goal is to work in the corporate, government, not-for-profit, or other sectors of the workforce.

However, technology will only fulfill its potential if we focus on pedagogy rather than technology itself. Otherwise, the technology is just cosmetic. Pedagogy must move away from lectures, and learning must become student-centered, project-based, and hands-on.

Along with professional learning, teachers need time and opportunities to work collaboratively, evaluate resources, and adopt new teaching strategies. They also need excellent digital content, and in emergent countries it's important to fund collaboration among universities, technology experts, and educators to create that content. New content and curriculum resources are emerging that align with emerging curriculum standards. As with any fast-changing area, teachers and curriculum specialists will want to evaluate these to ensure they meet the school system's quality standards. Teachers should be granted flexibility in adapting these new materials to provide personalized, inquiry- driven learning experiences.

Empowered with the right digital resources and teaching strategies, teachers can use powerful digital platforms to:

- **Connect curriculum with real-world issues** that students care about—both by exposing students to richer content resources, and by bringing experts into the classroom via digital media and video conferences.
- **Bring abstract concepts to life.** Whether by seeing molecules in 3D, simulating a chemical reaction, or doing dynamic geometry, digital resources help teachers build scaffolds that move students to mastery of sophisticated concepts.
- **Visualize learning.** With tools such as graphic organizers and concept maps, teachers can see what students are thinking.
- **Inspire students' creativity.** Students gain new ways to express themselves and create. In addition, students find educational video games exciting because they are in control. They can choose own path, make their own creations, and ignite their imagination.

As teachers change the way they teach, technology is providing powerful new ways to assess student progress, both to improve outcomes by providing immediate and highly targeted feedback, and to increase accountability. The challenge is to keep curriculum, teacher practice, and assessment in sync, and to provide professional learning and support so that teachers—and ultimately students—can achieve the fullest benefit.

Cristián Rizzi

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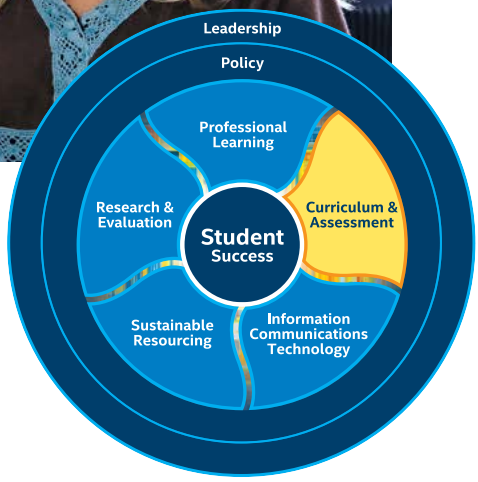


New Ways of Learning, Teaching, and Assessment

Mobile computers deliver the greatest educational impact and the strongest return on investment when they're paired with modern curricular frameworks, teaching strategies, digital resources, and assessment methods. In addition to engaging students with exciting interactive capabilities, data-rich digital content can empower teachers to create more evidence-based teaching strategies that help all students reach their full potential. In a transformed learning environment, schools become learning communities, teachers become guides and facilitators, and students become active learners and problem solvers. To help achieve that transformation, this chapter covers:

- Modernizing the curricular framework
- Using digital learning environments to support next-generation learning
- Incorporating ICT into new teaching strategies
- Choosing digital content and resources to support curriculum objectives and meet other requirements
- Aligning assessment with evolving curriculum standards to improve learning outcomes

Modernizing the Curricular Framework

Modern curricular frameworks, aligned with effective assessments, are essential elements of education transformation. A more modern framework can better reflect the aspirations of 21st century students and the requirements for success as next-generation college students, workers, and citizens. Effective curriculum frameworks encompass subject-matter requirements as well as 21st century or transversal skills such as collaboration, communication, and critical thinking.

Assessment needs to change to reflect the new curriculum. In the United States, for example, the Common Core State Standards (CCSS) provide voluntary, internationally benchmarked K-12 standards and graduation requirements for math and English language arts. The CCSS initiative also creates a new framework for assessment that aims to strengthen accountability and align curriculum with assessment.

Flexible, well-written standards and frameworks recognize the importance of student-driven, personalized learning. Effective curriculum frameworks and school cultures give teachers wide flexibility to develop lesson plans and teaching strategies that implement the standards while delivering student-centered, personalized learning experiences.

Platforms for Learning

Digital learning environments support teachers in their mission to build academic success and enable students to reach their highest human potential. As Figure 6-1 shows, highly skilled teachers use ICT to:

- **Customize the learning experience** to match each student's cognitive strengths, learning style, and interests. Early in the transformation cycle, this can be as simple as teaching a whole-class lesson with the reading assignment calibrated to different ability levels. As transformation moves forward, it can shift into a fully personalized, student-centered environment in which students take control of their learning and teachers act as activators, guides, and facilitators.
- **Expose students to a vast universe** of content and resources, including adaptive software that adjusts the presentation of content based on the student's interactions with the material. Digital content can increase engagement and retention through capabilities such as video, audio, graphics, animations, virtual reality, simulations, and gaming.
- **Activate and engage students** in inquiry-driven projects that are based on solving real-world problems and relevant to students' lives and passions.
- **Promote collaboration** with peers and experts, locally and globally. Students develop the ability to work in teams, reconcile competing points of view, and communicate with relevant audiences. These collaborations bring the world into the classroom, foster cross-cultural communications and understanding, and allow students to broaden their vision of the future and their place in it. Connecting with experts can also promote entrepreneurialism, and increase students' awareness of career and training options.
- **Prepare students** for standards-based assessments while delivering rigorous experiences that activate each student's learning path.
- **Enable students** and teachers to build their success by creating personal learning communities.

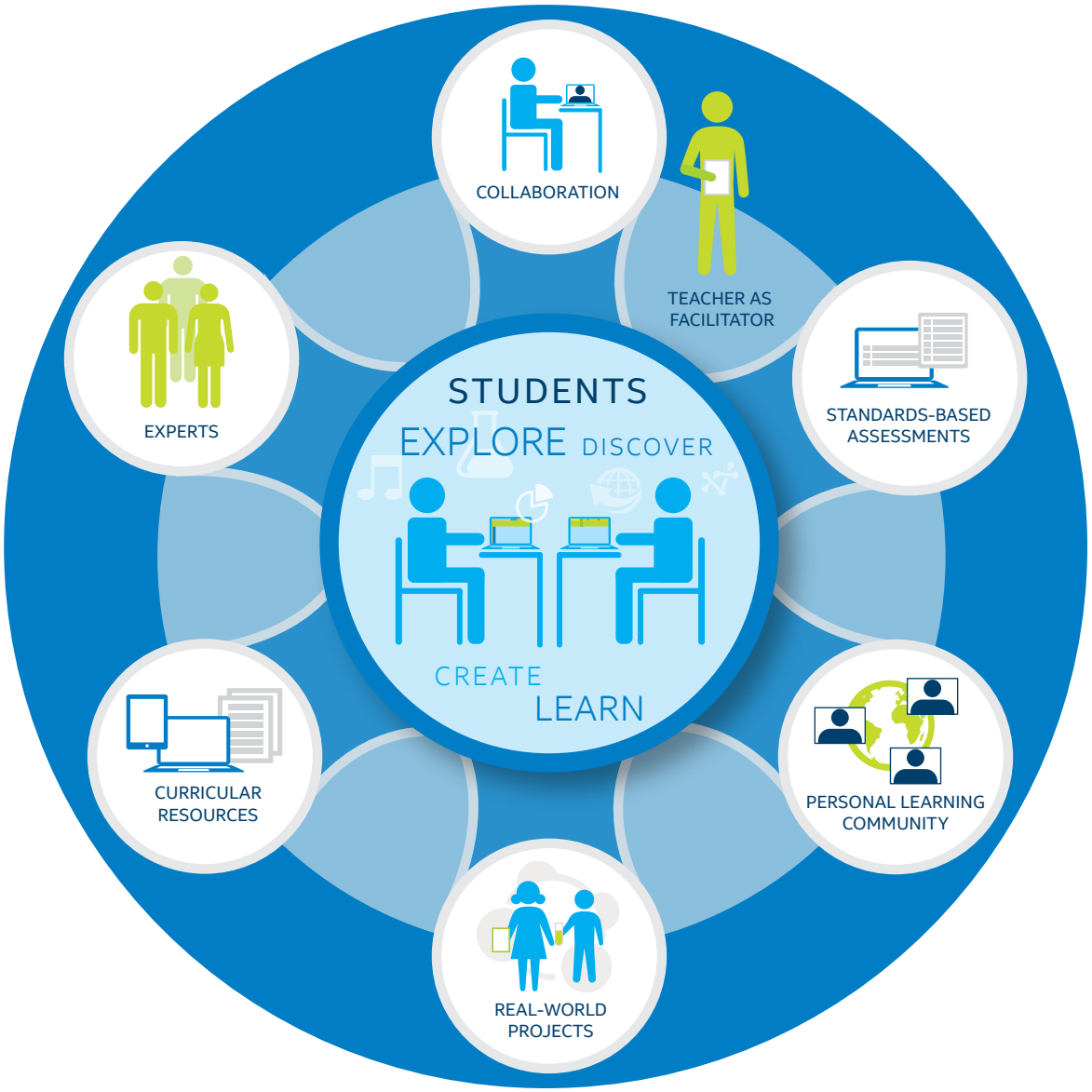


Figure 6-1. Student Use of Digital Resources to Explore, Discovery, Create, and Learn

Guided by skilled teachers, digital learning environments can help students drive their own learning, deepen their understanding, structure their knowledge, and grow as developing experts. **Students** can:

- **Conduct** learning activities that would otherwise be impossible or impractical, such as creating and interacting with a simulated climate model, or conducting virtual experiments without the need for expensive equipment and time-consuming setup
- **Use** virtual laboratories and educational gaming software to simulate, explore, and understand scientific concepts, solve challenging problems, and more
- **Engage** with complex text, identify key points, and use evidence to support a thesis
- **Conduct** virtual conversations and broadcast sessions with experts and peers
- **Participate** in virtual field trips
- **Learn** to filter and evaluate resources, develop the skills they will need as life-long learners
- **Access** learning resources when and where they need them

In a one-to-one environment with powerful mobile devices and high-quality digital resources, **teachers** can more easily:

- **Empower students** to learn anywhere and work more autonomously, whether individually, in small groups, or as a whole class
- **Analyze and understand** each student's progress toward mastery, and apply evidence-based teaching strategies that address individual learning styles, interests, pace of learning, degree of content mastery, and special requirements
- **Bring the world** into the classroom, having students use video conferencing to interview and collaborate with outside experts and partner schools
- **Extend learning** beyond the school's walls, managing student internships and community projects
- **Provide** innovative ways for students to demonstrate what they've learned
- **Activate** students to synthesize what they've learned and use higher-order thinking and creativity skills to build new content

Many digital resources provide practical benefits in addition to improving student learning. For example, teachers can:

- Use agile and up-to-date content compared to physical textbooks
- Deliver content in multiple languages
- Use productivity tools to more easily organize and manage courses, content, assessments, and other information

A literature review conducted by the United States Department of Education (DOE) found a range of pathways through which teachers can use digital resources to improve students' learning (see Table 6-1 for examples). The study notes that these improvements can occur at the same or lower cost than traditional methods, thus increasing educational productivity.

Using Digital Learning to Increase Educational Access and Effectiveness[18]

Methods	Examples
Broaden access to resources and experiences	• Enable students in rural areas and other underserved regions to access high-quality educational resources
Engage students in active learning	• Replace lectures with individual and group work such as online discussions and content that integrates formative assessments • Use digital simulations and visualizations to make abstract concepts easier to understand • Develop students' understanding of multiple perspectives through educational games
Provide individualized, differentiated instruction	• Use adaptive learning environments and diverse resources to meet each student's needs • Use features such as hypertext and multimedia to make content more understandable for a variety of students • Use online, formative assessments to give students immediate feedback that increases learning and helps them move through a learning progression more efficiently
Enable personalized learning	• Offer a "buffet" of resources that align with curriculum goals, enabling students to shape their learning paths to reflect their interests
Maximize teachers' and students' time	• Use learning management systems and other tools to more quickly create individualized, differentiated, and personalized educational experiences • Automate students' routine activities and use class time for activities that develop higher-order skills

Table 6-1 Summarized from US Department of Education, *Understanding the Implications of Online Learning for Educational Productivity*, 2012

Analysis conducted by Project RED[19] aligns with the Department of Education's recommendations. Project RED found that one-to-one mobile technologies produce the greatest academic impact when teachers incorporate technology into core subjects every week, and use technology across the curriculum, including in intervention classes. High levels of success are also associated with having students use technology for online formative assessments at least weekly and for virtual field trips at least monthly.

New Learning Models

Teachers can incorporate digital platforms and resources into diverse learning models and teaching strategies that engage students in active learning, provide deeper learning experiences, and meet diverse student needs:

- **Personalized learning** occurs when the teacher crafts a learning program for each student's learning preferences, interests, and needs. Real-time input from embedded formative assessments are a key enabler of personalized elements, enabling teachers to base instruction on an in-depth understanding of the individual student's preparedness and ability.
- **Adaptive learning** is a subset of personalized learning that brings together the latest advances in cognitive psychology, learning theory, neuroscience, data analytics, and other fields. Adaptive educational software, running on the student's mobile device, analyzes student performance as the student interacts with the software. The software then modifies the learning pathway and adjusts the presentation of material dynamically. Adaptive learning is a rapidly evolving area.
- **Blended learning** combines traditional, face-to-face teaching and online learning, giving students the flexibility to study when and where they choose, on their own or with others, at the pace that meets their needs. Students typically use adaptive software that customizes the learning for the student's personalized learning profile.

- **Flipped or inverted classrooms** are a form of blended learning that reverses the typical sequence of instruction. Typically, teachers introduce a topic in class via a lecture, then have students practice and apply the lesson at home. With flipped instruction, students are introduced to new content via videos, simulations, educational games, or other digital media that they watch at home on their personal computing device. The next day, students use class time to explore the content and concepts further through individualized and small group activities, collaborative projects, and other hands-on activities. At home, students can review the content as much as they need to. In class, teachers can provide more differentiated guidance and students can get help from peers and teachers as they solve problems and deepen their understanding of new concepts.
- **Integrated studies** combine two or more subjects—such as science and literacy—to deepen students' knowledge of both subjects and strengthen their understanding of connections across subjects. Integrated studies can also increase students' motivation, creativity, and problem-solving skills. For example, in a science and literacy class, students not only conduct hands-on experiments, but also discuss and write about them.
- **Real-world, project-based learning** builds off students' natural curiosity. It focuses learning around real-world problems and authentic, inquiry-driven learning experiences. Effective project-based learning can increase retention of content, improve students' attitudes towards learning, and provide other benefits.[20] Technology can help teachers bring outside experts into the classroom via video conferences and other collaboration tools. It can also help teachers create "schools without walls," establishing and managing internships in which students work meaningfully in organizations such as businesses, research centers, medical institutions, nonprofits, and cultural centers.

For an example of inquiry-driven, project-based learning, see *Case Study: Science Learning and Exploration in a Rural K-5 School*. For a research summary showing that powerful mobile devices provide benefits even in relatively simple usages, see *Case Study: San Luis, Argentina's All Kids Online Program*.

Choosing Content and Resources

Educators can choose from a wide and growing universe of digital resources, such as:

- Comprehensive instructional software
- Video and multimedia collections
- Educational games
- Experiments and simulations
- Online classes
- Tools for publishing, analyzing, collaborating, visualizing, and modeling
- Curriculum management tools
- Assessment tools

Digital resources contain a variety of capabilities that can meaningfully engage students in active learning. Useful features can include:

- Dynamic capabilities, from photos and graphs to interactive elements, animations, audio, music, simulations, gaming elements, pop-up explanations, and other multimedia capabilities
- Embedded tools such as calculators and spreadsheets
- Tools to enable content creation, communication, and collaboration, such as the ability to highlight and annotate text, create wikis, and edit video and graphics
- Embedded links to other content and experts

A learning management system (LMS) or content management system (CMS) adds to the digital environment by:

- Providing a single point of entry for teachers and others to create, share, and maintain content ranging from student blogs to course content
- Simplifying or automating tasks such as record-keeping, student assessments, and data analysis, improving educational efficiency and productivity
- Providing valuable data for evaluating the program's success

Both open source and proprietary solutions are available.

Resource selection works well as a collaborative process driven by educators and focusing on identifying flexible, robust, high-quality resources that align with curriculum and assessment standards. ICT participation on the selection teams can help facilitate technology adoption and identify any potential security, compatibility, or software management issues. Table 6-2 summarizes criteria to consider as you evaluate and select digital curriculum resources.

Selection Criteria for Digital Content, Tools, and Resources

Focus Area	Criteria
Curricular and assessment requirements	• Compatible with your curriculum objectives, assessment standards, pedagogic approaches, and devices • Supported by a range of content from nonprofit, open source, and commercial organizations • Grounded in research principles • Rigorous • Incorporates capabilities that keep students meaningfully engaged and add value to the learning experience • Uses visual and interactive elements for meaningful learning, not just for flash • Designed to inspire, engage, and challenge students • Supported by effective assessments • Provides built-in analytics and reports, if relevant
Usability	• Easy for teachers and students to use • Easy to customize and personalize to meet individual students learning styles, abilities, content mastery, and interests • Easy for teachers to present and disseminate content in multiple ways • Easy for teachers to extend content by reformatting, combining resources, modifying, etc. • Easy for teachers to identify and select content to meet curriculum requirements
Costs and management	• Easy to upgrade to newer versions • Available in multiple languages • Compatible with your budget and licensing model • Open source or affordable options for licensing or subscription services

Table 6-2

Next-Generation Assessment: New Ways to Improve Student Success

As curricular approaches evolve, assessments must advance to remain in alignment. Modern technologies offer powerful ways for students to demonstrate their progress toward mastery. New assessment methods also provide valuable, real-time data that students and teachers can use to adjust learning and teaching on the fly. These factors make assessment a cornerstone of the framework to transform education and improve student outcomes.

Based on a review of global studies, the Council of Chief State School Officers (CCSSO) concluded that effective assessment systems[22]:

- Are grounded in standard-based curriculum and managed as part of an integrated approach that links standards, curriculum, assessment, pedagogy, and professional learning
- Use a variety of measures to evaluate student performance on challenging tasks where they apply knowledge and skills
- Involve teachers closely in developing the assessment system
- Evaluate students and schools, i.e., they provide meaningful data for improving learning outcomes and accountability
- Give students and teachers valuable information they can use to improve learning
- Use ICT to provide immediate feedback, give students new ways to demonstrate their learning, and integrate information for analysis and increase accountability

Technology as an Enabler

In keeping with the shift to student-driven learning, assessments in the transformed environment involve students as active participants in assessment. Mobile devices and digital resources give students new ways to authentically and creatively express what they've learned, including both content mastery and the development of 21st century skills such as critical analysis and problem-solving.

Assessments delivered via digital content and tools can go beyond traditional multiple-choice exams. Students can create digital portfolios that include text, audio, video, and other elements. They can engage with computer-based simulations that put students into novel situations and ask them to solve problems, or create constructed responses to assess critical thinking and communication skills. Student self-assessments become a highly useful tool.

Secure platforms such as school web portals make it easier for students, teachers, and parents to review student progress and do collaborative goal-setting. This capability becomes especially important as students progress toward self-directed learning.

Data to Improve Instruction in Real Time: Formative Assessments

Technology-enabled formative assessments occur during instruction and give students and teachers immediate feedback they can use to quickly assess learning and improve outcomes. Formative assessments can provide a starting point for instruction (by showing what students know and identifying gaps and pre-conceptions). They can also show how well student are progressing toward their learning goals. Formative assessments and adaptive content can provide fine-grained information about student interests and developing skills to help teachers create and manage a personalized experience for each student.

Formative assessments students also empower students as they advance from passive to active learning. Timely feedback from formative assessments enables students to identify their learning styles, understand their strengths and weaknesses, recognize gaps in their learning, and develop a plan for addressing them.

Aggregate Performance and Accountability: Standards-Based Summative Assessments

Summative assessments aim to determine mastery of material. They typically come at the end of a unit, course, or period of time. Summative assessments are important for:

- Understanding aggregate performance and comparing progress between groups of students
- Tracking student progress over time
- Ensuring accountability
- Inspiring stakeholders to raise expectations and increase investments in education

Standardized summative assessments, conducted nationally and globally, can help evaluate aggregate performance and identify shortfalls and areas for improvements. For example:

- OECD's PISA program offers its international benchmark testing of 15 year-olds every three years. PISA 2015 tests will introduce collaborative problem solving as a required area of skills assessment.
- The International Association for the Evaluation of Educational Achievement (IEA) offers two sets of tests around the world. The Trends in International Mathematics and Science Study (TIMSS) assesses the math and science skills of fourth and eighth grade students every four years. TIMSS Advanced assesses advance mathematics and physics for students in their final year of secondary school. The Progress in International reading Literacy (PIRLS) measures the reading comprehension skills of fourth graders.
- In the United States, the National Center for Education Statistics offers the National Assessment of Educational Progress (NAEP), the largest continuing, nationally representative assessment of student performance in mathematics, reading, science, writing, and other areas. In 2014, the NAEP added an assessment for technology and engineering literacy. Two consortia, the Partnership for Assessment of Readiness for College and Careers (PARCC) and the Smarter Balanced Assessment Consortium are developing online assessments that align with the Common Core State Standards.

Curriculum and Assessment Implementation Checklist

Key Tasks

- Modernize and align curricular frameworks and assessments to reflect your goals for student learning
- Choose and deploy a variety of content, tools, and resources that students and teachers can use to fulfill curriculum requirements in ways that match each student's learning style, interests, and academic goals
- Use formative and summative assessments to improve student outcomes

Steps to Success

Curriculum Planning and Development

- Ensure that your school or school system's curriculum align with the standards and benchmarks of your state, province or municipality, and nation. For those developing national and state/provincial standards, ensure teachers have the flexibility, professional learning, and support to implement them in ways that meet each student's needs.
- Establish clear objectives that define the improvements you want to see in student learning and achievement.
- Based on needs assessments, analysis of your pedagogic base, and learning objectives, develop a framework of pedagogic strategies and a roadmap to transformative use of ICT resources. If necessary, start by incorporating ICT into existing strategies, then introduce newer instructional strategies to support broader change. Consider a variety of pedagogic approaches (flipped classroom, blended learning, project-based learning, etc.).
- Work collaboratively to determine how you will use digital resources and mobile devices to enhance new and existing teaching strategies.
- Develop a process for choosing content resources. Establish collaborative teams to identify high-quality content resources that support evolving curriculum and assessment standards as well as the pedagogic approaches you are focusing on. The teams should be driven by educators, but ICT staff should be involved to advise on any potential security and management issues.
- Enhance productivity by avoiding a chaotic software environment. A smaller number of robust, flexible platforms and applications will make it easier for teachers to develop expertise and share best practices. The environment is also more cost-effective to manage and support.

- Provide tools and training so teachers can create their own content. Establish portals or learning management/content management systems so teachers can share the resources they find and create. Choose an LMS/CMS system that provides detailed, usable data analytics and reporting capabilities to help you improve learning outcomes and evaluate your initiative's success.
- Collaborate with communities of practice, other districts, school systems, and education leaders to identify high-quality resources and practices.
- Develop a mix of open source, teacher-created, and publisher-created content that matches your curriculum goals, quality requirements, and budget resources.
- Collaborate with content developers, academics, and industry experts to accelerate the development and translation of high-quality curriculum and content resources.
- Educational software solutions are evolving rapidly, so continue to monitor new offerings.
- Provide professional learning opportunities for teachers to master new curricular frameworks, content resources, and methods of assessment.

Next-Generation Assessment

- Establish a multi-level framework of assessments that aligns with curriculum standards and pedagogy. Use a variety of assessment methods to evaluate student learning and provide continuous feedback that improves student outcomes. Focus more on learning outcomes and less on traditional metrics such as seat-time or the completion of specific content.
- Use technology to give students authentic ways to demonstrate learning, and support teachers in developing new ways to assess the results of collaborative and project-based learning.
- In planning changes to assessments, start with the learning outcomes you are trying to achieve. Work backward to develop metrics that indicate progress and allow you to measure success in meaningful ways. Use the results to increase system accountability and improve individual student learning.
- Avoid over-reliance on multiple-choice assessments, which don't capture students' progress in higher-level thinking.
- Engage students, teachers, parents, and the community to build consensus on the goals and benefits of new curricular and assessment approaches. Listen to and address any concerns.

Technology Planning

- Establish a team to determine device requirements for curriculum, content delivery, and assessment, as well as data security and device management. Include teachers, administrators, students, and ICT professionals.
- Create a digital learning environment that supports your curriculum requirements. In addition to mobile devices and content, consider equipment that adds value to the digital environment:
  - Software-based lab cameras, probeware, and other scientific equipment
  - Interactive whiteboards
  - Interactive response devices or software for immediate feedback, votes, quizzes, etc. for formative assessments
  - Digital cameras
  - Digital video equipment
  - Document cameras
  - Video displays in libraries, hallways, cafeterias and other common area to display common work or allow ad hoc collaboration and encourage creativity
- Establish a secure data system that can provide accurate longitudinal data on individual student progress as well as system-level data such as graduation and dropout rates.
- Develop a plan for managing the practical aspects of the digital environment, such as how teachers will collect students' work and submit grades.

CASE STUDY

Science Learning and Exploration in a Rural K-5 School

A K-5 public elementary school in the rural Appalachian highlands of Maryland, U.S.A., Crellin Elementary School was once an underachieving school with declining test scores. Today, Crellin students are some of the highest achievers in the state, and the school has earned national awards for student achievement, parent involvement, environmental leadership, character education, and more.

Technology plays an important role in supporting the curriculum objectives at Crellin. Teachers use mobile devices, science probes, and other digital resources to create authentic experiences that focus on student-centered, inquiry-driven, project-based learning. Projects often combine technology with math, science, social studies, research, writing, media and communication, and a healthy dose of creativity and fun.

"We view national and statewide standards as a floor, not a ceiling—they're the bare minimum we strive for," says Crellin's principal, Dana McCauley. "We align with the state standards, but we also use real-life issues and students' interests as focal points for research and problem-solving. We never use technology for its own sake. It's always about helping our students be good people, critical thinkers, and problem solvers."

Crellin teachers often collaborate to create all-school projects that last a full year. For a 2013/2014 agriculture project, teachers started from the Intel Seasoning the School Year unit and developed activities for each grade. Their preparations spanned the 2012/2013 school year and included acquiring lambs and chickens, working with the community to build a barn, and gaining certification to sell eggs.

Through the project, children learn to think like young scientists. They conduct inquiry-driven research, discovering the answers to questions such as what scents are more likely to draw coyotes and how various conditions affect chicken-laying behavior. Using mobile computers, probeware, and other software, the children gather data, analyze their results, and report their findings. They build their mathematical and communication skills, as well as creating spreadsheets and graphs to better explore, examine, and explain their data. They communicate with local and distant experts when it is relevant to do so, and often present their results to serious audiences—from local community organizations to college science and education classes.

Teachers use **digital resources** to **create** authentic experiences to focus on **student-centered learning**

Year-long science project—children **become young scientists**

CASE STUDY

San Luis, Argentina's All Kids Online Program

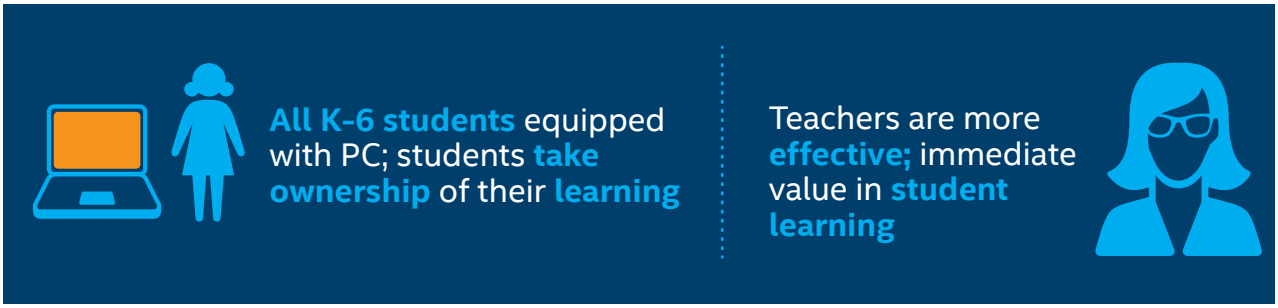
In developing nations and under-resourced school systems, textbooks and even paper can be scarce or shared resources. Mobile devices can add dramatic value in even when the devices are used with existing teaching strategies.

All Kids Online is part of a broad, 20-year initiative to transform the society and economy of the rural province of San Luis, Argentina. As in many Latin American schools, San Luis primary-school students previously relied on a copybook as combination textbook, workbook, study guide, notebook, and portfolio. The All Kids Online initiative is equipping all K-6 students in San Luis with an Intel® classmate PC, and all K-6 teachers with a laptop. The program also includes educational software, mentors, wireless broadband connectivity for homes and schools, and additional classroom technologies.

In a research project funded by Intel,[21] researchers from the Education Development Center (EDC) observed classrooms at three San Luis primary schools. The research team found that because of All Kids Online, students' classmate PCs had replaced the copybooks and become a daily part of learning and teaching. Simply using the digital resources primarily as copybook replacements facilitated five important changes:

- Teachers managed the classroom more efficiently, giving them more time and allowing them to personalize resources to each student's level.
- Students and teachers could access a wider variety of educational resources, and each student had his or her own set of materials. Students spent more time on task.
- Students took ownership of their learning. They directed more of their own learning, controlling their own pace and taking on more activities as they were ready.
- Students received more frequent feedback. Even simple interactive worksheets helped learners practice and problem-solve, and kept them working longer. Teachers made better use of their time with students, and students could study outside of school.
- Students, teachers, and parents enjoyed more fluid communications, using tools such as chat and ad hoc video conferencing to ask questions or send homework reminders.

By making the teacher's job easier and more effective, these changes are leading to substantial improvements in student learning. They deliver immediate value while advancing San Luis schools toward deeper transformation.



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19 T. Greaves, J. Hayes, L. Wilson, M. Gielniak, and R.F. Peterson, *The Technology Factor: Nine Keys to Student Achievement and Cost-Effectiveness,* MDR 2010. http://www.pearsonfoundation.org/great-learning/research-reports-and-surveys/project-red-the-technology-factor.html.

20 Edutopia, http://www.edutopia.org/pbl-research-learning-outcomes.

21 Download the whitepaper *Highlighting Changes in the Classrooms of a Successful 1-to-1 Program in Rural Argentina: Case Studies of Todos los Chicos in la RED in San Luis* by Daniel Light and Elizabeth Pierson, May 23, 2012, at http://www.intel.com/content/www/us/en/education/evaluations/changes-in-argentina-schools.html

22 School Technology Action Report, *Doing More with Less: How Informed Assessment Practices Can Help,* 2012, eSchool News.

Resources

The following sites and organizations are leaders in developing innovative resources, tools, and/or perspectives on curriculum and assessment for 21st century learning.

- Achieve: http://www.achieve.org/
- Assessment and Teaching of 21st Century Skills (ATC21S): http://atc21s.org/
- Educurious: http://educurious.org
- Edutopia: http://edutopia.org
- International Society for Technology in Education (ISTE): http://iste.org
- Literacy Design Collaborative: http://www.ldc.org/
- Mathematics Design Collaborative: http://www.mdc.org
- National Assessment of Educational Progress: http://nces.ed.gov/nationsreportcard/
- New Pedagogies for Deep Learning, Global Partnership: http://www.newpedagogies.info/
- OECD's Personalising Education book is available for order at: http://www.oecd.org/edu/school/personalisingeducation.htm
- Partnership for 21st Century Skills: www.p21.org
- UNESCO ICT Competency Framework for Teachers Project: http://www.unesco.org/new/en/unesco/themes/icts/teacher-education/unesco-ict-competency-framework-for-teachers/
- Implementing the U.S. Common Core State Standards: http://learningforward.org/docs/default-source/commoncore/professional-learning-plans.pdf